SPILLAN

DR. SPILLAN'S

MANUAL OF DIAGNOSIS

OF

Diseases of the Chest,

ETC.

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A MANUAL

OF

ERCUSSION

AND

AUSCULTATION,

AS EMPLOYED IN

HE DIAGNOSIS OF DISEASES OF
THE CHEST AND ABDOMEN.

By D. SPILLAN, M.D.

"——PULSA, dignoscere cautus
Quid solidum crepet." PERS. Sat. v.
Jamdudum AUSCULTO—cupiens tibi dicere
pauca.' HOR.
——fœcundum CONCUTE pectus." VIRG.

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PREFACE

THE history of this little book is soon told. It is intended to afford to the medical student a portable manual of auscultation and percussion, pointing out the application of acoustics to the diagnosis of disease. The compiler has endeavoured to combine convenience of form with as full a detail of the principles of the science as can be deemed necessary to enable the practitioner to avail himself of this invaluable auxiliary of modern pathology in the diagnosis of thoracic affections. In the truth of the following remark made by Dr. Latham in his excellent work on Clinical Medicine he fully concurs: "I am convinced that the whole subject of auscultation would have been better understood, if a little less artifice had been used in the methods of teaching it."

For information on diseases of the heart and lungs the British reader cannot be at a loss. The valuable works of Drs. Elliotson, Forbes, Latham, Hope, Davies, and Stokes, afford all that can be desired on these subjects. The simplicity of its arrangement, as well as the masterly and practical views of cardiac disease contained in Professor [illegible]'s work, leave us reason to regret that his book has not been brought out in a more portable form.

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A MANUAL,

&c. &c.

CHAP I.

OF PERCUSSION.

1. *Percussion* is a means of diagnosis founded on the results obtained by striking with the fingers the parietes of the sphlanchnic cavities, for the purpose of ascertaining the physical condition of the organs contained in them, with respect to their dimension, form, consistence, and density, by means of the sound which those parts yield, and the sensations which they convey to the fingers on striking them.

2. The only parts of the body to which physicians have as yet applied this mode of investigating disease, are the thorax and abdomen. The thorax, formed as it is of solid and elastic parietes, and being for the

most part filled by the lungs, which under ordinary circumstances contain a large quantity of air, is peculiarly adapted to yield a very clear sound on percussion.

3. All parts of the chest, however, do not yield sounds equally clear on percussion, even in the state of health, as the sound is somewhat more obscure in the region of the heart, and of the liver, along the course of the vertebral column, and over the scapulæ.

4. As many of the diseases of the chest mechanically exclude a portion of the air contained in it in the healthy state, percussion on its surface will in such circumstances necessarily indicate the change that has taken place in the density of the parts within.

5. After having become familiar with the sounds emitted by the chest in the natural condition of the contained organs, we shall be able readily to distinguish the dull sound which is produced, when the lungs, or any part of them, are gorged, or infiltrated, from the clear resonance

of the healthy state, or that unnatural exaltation of it which takes place in certain morbid states, as in pneumo-thorax.

6. Percussion may be performed either immediately on the surface of the body, or on any solid or tense substance firmly applied to it. The former is called *direct percussion*, the latter *mediate percussion*.

7. *Direct percussion* consists simply in striking the chest with the extremities of two or more fingers, so placed, that their extremities may be in one line, the fingers at the same time being pressed together with considerable firmness. The strokes should be made with some force, so, however, as not to give pain, and should follow in quick succession, the fingers being raised rapidly from the chest.

8. As the intensity of the sound partly depends on the quantity of air contained in the lungs at the moment the percussion is made, it is better to percuss during or immediately after inspiration, when the lungs are full. In obscure cases, it is often necessary to desire the patient

to take a deep inspiration, and then retain his breath for a few seconds.

9. Percussion should be made with the *ends*, and not the pulpy portions of the fingers, and the stroke should be made perpendicularly, and not obliquely. It is also necessary to the production of a full sound that the walls of the chest be made as tense as possible, and for this purpose certain positions of the body are required. The patient should, if possible, get out of bed and [illegible]. When the anterior part of the chest is under examination, he should raise the head and throw back the shoulders; and when the posterior part of the chest is to be examined, he should stoop the head, and cross the arms, so as to render the whole back rounded or arched. When examining the lateral parts of the chest, the arm of that side should be raised, and the body inclined to the opposite side.

10. The covering over which we percuss should be drawn very tight across the part; and we should be careful to strike corresponding points, when percussing comparatively both

sides, and also with the same degree of force.

11. The degree of natural sonorousness in all cases depends on the state of the external parts, and on the condition and relative position of the organs placed beneath them. The thinner and tenser the parietes, the greater the mass of the air-filled pulmonary substance beneath, and the closer it approaches the surface, the greater will be the natural resonance on percussion, and *vice versâ*. The following artificial subdivision of the thoracic surface as given by Laennec, will considerably facilitate the student's progress in this department. The division is into fifteen regions, twelve of which are double.

12. *Subclavian region.*—This includes merely the portion of the chest corresponding to the clavicle. This bone, when struck about the middle, or at its sternal extremity, yields a very clear sound, whilst its humeral extremity, on the contrary, yields a dull sound. The importance of knowing the healthy and morbid sound of the chest in this region is obvious, as

from it are usually derived the first signs of the development of pulmonary tubercles, it being now well known that tubercles occupy the upper lobes of the lungs much oftener than the other lobes.

II. *Antero-superior region.*—This is bounded by the clavicle above, and the fourth rib (inclusive) below. The sound here is naturally very clear, but somewhat less so, however, than over the sternal end of the clavicle.

III. *Mammary region.*—This begins below the fourth rib, and terminates with the eighth. It can rarely be percussed in females; and in the male it seldom yields so good a sound as the antero-superior region, on account of the thickness of the inferior edge of the great pectoral muscle.

the 7th
according to
Dr. Watson

IV. *Submammary region.*—This extends from the eighth rib to the cartilaginous border of the false ribs. On the right side it almost yields a dull sound on account of the presence of the liver; while on the left side it frequently yields a clearer sound than natural, and which may be called almost tympanitic, owing to

to the
according to
Dr. Watson

the presence of the stomach distended with gas. In some rare instances, the unusual size of the spleen may occasion the dull sound.

V. *Sternal regions—superior, middle, and inferior.*—Over the whole extent of the sternum the sound is as clear as on the sternal end of the clavicle. In certain cases, however, particularly in very fat persons, the lower portion of the sternum yields a duller sound, on account of the great quantity of fat about the heart.

VI. *Axillary region.*—This commences at the upper part of the axilla, and terminates at the fourth rib inclusive; it yields a clear sound.

VII. *Lateral region.*—This region commences beneath the fourth rib, and terminates at the eighth. 7d according to Dr Watson. It always yields a clear sound on the left side; on the right the sound is frequently much less so, in consequence of the liver rising higher than ordinary, and compressing the lung upwards, and thereby rendering it more dense. The healthy liver seldom rises higher than the sixth, or at most the fifth rib.

VIII. *Inferior lateral region.*—This extends from the eighth rib to the border of the cartilages of the false ribs. For the reason already assigned, this region on the right yields a sound almost always less sonorous than the left. Sometimes the sound is quite dull; whilst the left side, on the contrary, frequently yields a clearer sound than natural, and this although there may exist engorgement of the inferior portion of the lung, or an effusion of liquid into the pleura of that side.

IX. *Acromion region.*—This is comprised between the clavicle, the upper edge of the trapezius muscle, the head of the humerus, and the inferior part of the neck. Here there is no resonance.

X. *Superior scapular region.*—This region corresponds to the supra-spinous fossa of the scapula, and hardly yields any sound on account of the supraspinous muscle that fills it. The spine of the scapula, which bounds this region below, sometimes yields a slight sound, but this only when the arms are very forcibly crossed.

XI. *Inferior scapular region.*—This region corresponds to that portion of the scapula below its transverse spine; here also there is scarcely any sound on account of the thickness of the muscles.

XII. *Inter-scapular region.*—This region is comprised between the inner margin of the scapula and the spine, when the arms are crossed on the breast. It is difficult to obtain any sound from it, owing to the thickness of the muscles. Sometimes, however, a moderate, but still sufficiently distinct sound may be elicited, more particularly in thin persons, and when the arms are forcibly crossed and the head bent forward. The dorsal spine in this region yields a tolerably clear sound, as does also that portion of the chest included between the interior superior angle of the scapula and the first dorsal vertebra.

XIII. *Inferior dorsal region.*—This region commences at the inferior angle of the scapula, and terminates at the twelfth dorsal vertebra. To obtain any sound from this region, especially in fat patients, we should percuss the angle of the ribs in a transverse direction. The sound is tolerably clear in the upper portion of this region; but a little lower it is often obscure, or even dull; and on the right side it is almost always obscure, on account of the situation of the liver.

13. M. Piorry has introduced another method of practising percussion, which is called *mediate percussion*. He interposes between the fingers and the part to be percussed a small plate of ivory, which he calls a *pleximeter* (*πλησσω to strike*, and *μετρον, a measure*). This instrument is of a circular or ovoid shape, from one inch and a half to two inches in diameter, and about one sixth of an inch in thickness. It is necessary that this instrument, when employed, should be applied accurately and closely, and that perfect apposition be insured between the instrument and the surface of the body to which it is applied. The firmness and tension of most parts of the thoracic parietes render the employment of this in-

strument unnecessary in investigating thoracic disease; but in percussing the abdomen, possessed as it is of soft and yielding walls only, the pleximeter is very necessary for the production of the requisite degree of sound, and by means of it we can bring the superficial walls, by pressure, in contact with the subjacent parts.

14. A more simple variety of mediate percussion consists in the substitution of one or two fingers of the left hand for the pleximeter, the *back* of the fingers being applied to the chest of the patient. This is preferable to Piorry's method in cases of considerable emaciation; for by carefully applying the fingers so as to make them fit accurately into the depressions at the intercostal spaces, we can often employ considerable percussion without exciting pain—it should be observed that some prefer placing the *palmar* surface of the fingers in contact with the surface to be explored.

15. We have now seen that in the natural, or healthy state, the sound

obtained by percussing the [illegible] regions of the thorax is for the [illegible] part clear, except over the re[illegible] the heart and liver; [illegible] ever the sound is very [illegible], ex-tremely clear, amounting to that degree which may be called tympanitic, as over the stomach. The dulness and excessive clearness [illegible] be shown obviously to arise from natural causes.

16. The student, having made him-self familiar with the relative sonorousness of the different parts of the chest in the healthy state, [illegible] with the topographical relations of the external and internal parts on which this relative sonorousness must depend, will now be enabled to appreciate the alterations which the healthy or natural sonorousness may undergo in consequence of [illegible]

17. The natural resonance [illegible] on percussion may be either diminished or increased, that is, [illegible] may be either dull in parts where it is naturally clear, or [illegible]

18. This natural resonance [illegible] will obviously be diminished [illegible]

the proportion of air ordinarily existing in the lungs is lessened by the addition of matters of greater density, which matters may exist either in the substance of the lungs, or external to them.

19. The chief alterations within the substance of the lungs which may give rise to dulness of sound are, hepatisation (in pneumonia), pulmonary apoplexy, and œdema, tubercles, foreign growths compressing the pulmonary substance. The alterations external to the substance of the lung, producing dulness of sound, are effusions into the pleura (*hydrothorax*) or into the pericardium, tumours developed in the cavity of the pleuræ, hypertrophy of the heart, aneurism of the aorta, &c.

20. The only cases in which the natural resonance is increased are pulmonary emphysema and pneumothorax.

We shall presently see what important assistance the stethoscope affords in distinguishing these several morbid alterations, and in enabling us to establish a correct diagnosis.

CHAP. II.

PERCUSSION OF THE ABDOMEN.

21. The normal sound [illegible] percussing the abdomen [illegible] rior surface is what may [illegible] *half-clear*; superiorly and [illegible] right side the region of the liver is indicated by a dull [illegible] ceases at the edge of the lower [illegible]. On the left the spleen merely [illegible] a slight dulness to the extent of [illegible] or two fingers' breadth in the region of the last false ribs; posteriorly the sound is more dull in the region of the kidneys. In exploring the abdomen by percussion the pleximeter or finger should be held superficially, if we wish to examine parts near the skin; whilst considerable pressure should be made, if we wish to examine the state of deeply seated organs.

22. On the right hypochondrium the upper surface of the liver, which is limited by the diaphragm, is convex, corresponding with the concavity of the diaphragm and that of the

base of the right lung, in the latter of which it is as it were enchased, in such a manner, that the posterior portion of the base of the lung corresponds nearly with the level of the inferior surface of the liver. The anterior edge of this latter surface corresponds nearly with the edge of the false ribs on the right side.

23. Towards the median line of the sternum, in the angle formed by the junction of the cartilages of the false ribs of each side (epigastrium) we find the cardiac and pyloric portions of the stomach; the body and cul de sac of this organ in a great measure fill the sub-diaphragmatic region of this side of the thorax.

24. The anterior wall of the abdomen, which is more extended than the posterior, is very much elongated along the median line, where it corresponds superiorly to the hollow at the base of the thorax, and inferiorly to the pubis.

25. Whilst examining the abdominal organs, the patient should lie

on his back, and the muscles of the abdomen should be relaxed by flexing the legs on the thighs, and the thighs on the pelvis.

26. The pleximeter should be almost exclusively employed in percussing the abdominal organs.

27. On percussing the anterior part of the base of the thorax, we find on the right the dull sound of the liver, on the left the tympanitic sound of the stomach. If we percuss the abdomen in the same direction, we find in the hollow of the base of the thorax the tympanitic sound of the cardiac and pyloric regions of the stomach somewhat less clear than that of the external part of this organ.

28. Lower down, the transverse colon extending to the right and left, immediately beneath the liver and stomach, yields the intestinal sound equally tympanitic, but a little less clear than the former. All the parts situate lower down afford the tympanitic sound more or less marked. The sound all over the other parts of

the abdomen will also be more or less clear, and in several points tympanitic.

29. The sound yielded by the abdominal parietes, in the morbid state, differs from the healthy sound, sometimes by its greater clearness, either in some one single organ, as in dilatation of the stomach, or over the entire surface of the abdomen, in cases of meteorism, and sometimes on the contrary by its dulness.

30. The dulness also varies in degree, and is accompanied by proportional resistance. This is not easily circumscribed in the intestines, but is more fixed and determinate, when it corresponds to hypertrophy of the liver, spleen, &c., or to different tumours in the abdomen.

31. As in the healthy state percussion gives no indication of the presence of the bladder, womb, or ovaries, should any dulness of sound be found in the regions corresponding to these organs, it must be considered as a morbid sign.

32. *Affections of the liver.*—In exploring the state of the liver, it

should be recollected that the organ extends upwards from two inches and a half to three inches towards the part nearest the sternum, four inches more external to this, and from four to five inches towards the lateral region; so that its transverse diameter is about from ten to twelve inches.

33. The knowledge of these limits and of the means of determining them must render it easy to appreciate those different morbid states of this organ, which are indicated by increase in its size.

34. Thus, when in some cases of *acute hepatitis*, or of congestion, the liver increases considerably in size, we shall be able to appreciate all these diameters by mediate percussion, and follow day after day the diminution which sometimes takes place rapidly after the proper remedies have been employed.

35. At other times the *hypertrophy* is but partial, and is confined to the left lobe of the liver, which then extends towards the spleen.

36. The pain which is then felt on

pressure in the epigastrium has been more than once attributed to gastritis. In this case mediate percussion will detect the *dulness* in the prolongation of the left lobe of the liver superficially, and more deeply seated the tympanitic sound of the stomach.

37. In other cases the intestines press the liver upwards, so that the respiration becomes embarrassed. Should the physician not be conversant with percussion, he will very often refer the dyspnœa to an affection of the lung or pleura, whilst percussion will demonstrate the total displacement of the liver, which passes up beyond its superior limit as much as it is removed inferiorly above its lower limit, and he will find the tympanitic sound of the intestines above the margin of the false ribs, where it is never found in the normal state.

38. At other times it is the upper edge of the liver alone which is raised without the other parts of the organ being at all displaced. This can be ascertained only by percussion.

39. If the liver passes beyond the margin of the false ribs, it is equally easy to determine its inferior prolongation, and to distinguish it from other tumours.

40. Neither does the complication of ascites prevent us from detecting the liver below the false ribs, as the dulness and resistance of this organ are always more marked than that of the effusion.

41. With respect to the different tumours of which the liver may be the seat, percussion will not always afford us decided information: but should these tumours be superficial, their *elasticity* and slight resistance to the fingers will enable us to distinguish abscesses from scirrhous masses, which are characterized by considerable *hardness* and *resistance*.

42. Hydatid tumours may sometimes be recognized by means of a *vibratory sensation*, which is communicated to the fingers.

43. *Distension of the gall-bladder.*—The mode of proceeding to ascertain this state is: percuss transversely the space immediately situate

below the inferior edge of the liver, where, in the normal state, the *tympanitic sound* of the intestines is found. When the gall bladder is distended, we shall detect in the region of this organ a slight dulness without resistance to the fingers, and very frequently, according to M. Piorry, the *humoric sound*.

44. *Enlargement of the spleen.*—The frequent coincidence between enlarged spleen and intermittent fevers renders it a matter of importance sometimes to ascertain the state of this organ. When the enlargement is downwards, so that the spleen passes below the margin of the false ribs, *palpation* will suffice to detect the enlargement; but when, as sometimes happens, the enlargement is upwards, so that the organs of respiration are pressed upon, percussion must be resorted to.

45. *Distension of the urinary bladder.*—In cerebral affections, &c., the urinary bladder often becomes distended with urine without the consciousness of the patient. To ascertain the state of this organ me

diate percussion has many advantages over the other means of exploration. The method to be employed is, to place the patient on his back, and apply the instrument over the umbilicus, some pressure being made, so as to compress the turns of intestine interposed between the bladder and the abdominal parietes. The bladder rarely ascends as high up as this, so that the *tympanitic* sound of the small intestines is that ordinarily heard in this part. On descending, however, along the linea alba, the *dull* sound is soon produced, accompanied by a slight resistance if the bladder is distended. These characters go on increasing according as we approach the pubis. The examination is repeated on both sides of the linea alba. If the dulness be owing to the presence of the bladder, the points of transition from the *clear* sound of the small intestines to the dull sound will form a curve corresponding to the upper circumference of the bladder. We shall be more certain on this point, when, by placing the patient alternately [illegible] both sides, and examining the abdomen each time, the dulness does not change place.

46. *Summary of the results obtained from percussion.*—The sounds obtained from percussion may be *tympanitic*, *clear*, *obscure*, or *dull*; another quality of sound is noticed as obtained by percussion, which is called the *silvery*, or *metallic sound*. Another advantage to be derived from percussion is, that in employing it we can estimate by the extremity of the fingers the density, elasticity and most of the physical properties, which are strictly appreciable by the touch, and which may afford the physician valuable information with respect to the texture and state of the parts under examination.

47. *The tympanitic sound* is detected in the thorax in emphysema and pneumothorax; and in the abdomen in cases of meteorism.

48. *The clear sound* is that which the parts of the thorax already mentioned present.

49. *The obscure sound* is heard on percussing the chest when pneu-

monia is passing from its first to the second stage, and when the resolution of the hepatisation is going on; in bronchitis also, when the lungs are engorged with mucus, &c. The tympanitic sound is usually the normal sound of the anterior region of the abdomen, when the abdominal parietes are of a certain thickness, and when the intestines are not distended with a considerable quantity of gas.

50. *The dull sound* is heard when the lung is hepatized, or when there exists considerable effusion. It should be remembered also that there are different shades of dulness; that the dull sound of the liver is not the same as that of a hepatized lung, nor the latter the same as that of hydrothorax.

51. *[illegible] or metallic sound.*—This name was first given to the sound yielded by percussing the subclavian regions, when they become the seat of tuberculous cavities. It seems to depend on the collision of the air and the liquids contained in the cavity, or on the passage of the air from a large cavity [illegible]

narrow aperture. This sound also received the name of the *bruit de pot felé*, the *sound of a cracked vessel*; others have given it the name of the *humoric* sound. This sound is produced on percussing the abdomen, whether gases and liquids exist together in a portion of intestine, or whether each of these bodies is found separately in contiguous portions, or whether the gas is contained in the intestine and the liquid in the peritoneum.

52. *Density of the tissues percussed.*—By means of percussion the nature and elasticity of the parts subjacent to the surface percussed may be ascertained. This information is obtained by means of a peculiar sensation conveyed through the pleximeter or finger, when mediate percussion is employed; only it is necessary that the percussing fingers should not be raised so quickly as when we merely wish to ascertain the nature of the sound yielded by the part.

CHAPTER III.

MEDIATE AUSCULTATION.

53. By means of the stethoscope we learn that the motions of the lungs and heart in a state of health produce certain sounds in certain parts of the chest, and that these sounds are modified in certain ways, and other sounds superadded, in states of disease. By the study of symptoms during life, and by dissection after death, we are able to connect as cause and effect, particular forms of disease with particular sounds.

54. When using the stethoscope, care should be taken to keep the thoracic extremity of the instrument in exact apposition with the surface on which it rests, and to preserve the meatus auditorius in accurate communication with the perforation in the instrument. The ear also must move to suit the instrument, and not *vice versâ*.

55. Too strong pressure also must

be avoided, lest pain be given to the patient; this is particularly necessary when the instrument is used without the stopper, and when the patient is lean.

56. The stethoscope may be applied either to the naked chest, or to the chest when covered; the covering however should be light, such as a shirt or flannel waistcoat. Silks and woollen stuffs are inadmissible, in consequence of the rustling noise they occasion by their friction against the instrument.

57. In cases of very lean subjects it is often necessary to apply compresses of lint, in order to fill up the inequalities, and thereby give the instrument a level resting place.

58. When examining the anterior parts of the chest, we should place the patient on his back, in a recumbent position, or in a chair, and gently reclining backwards. When examining the posterior parts, we should make the patient lean forwards, and keep his arms forcibly crossed in front; and when we examine the lateral parts, we cause

him to lean gently to the opposite side, and to elevate the fore-arm.

59 *Auscultation of the respiration.*—The penetration of the air into the organs of respiration is accompanied by a slight murmur, which is distinctly perceived by the art of auscultation, and is called the *respiratory murmur.*

60. This sound of healthy respiration is different in different parts, it has one character in the pulmonary cells, another in the larger bronchial tubes, and another in the trachea.

61. That which takes place in the pulmonary cells has been called *vesicular.* It is perceptible in health over every part of the chest with which the lungs are in contact. This sound differs from that produced in the trachea or bronchi in being accompanied with a slight crepitation; the tracheal and bronchial sounds also convey the impression as if they originated in a larger space: the latter has been called the *bronchial respiration.*

62. The following are the parts

where the vesicular respiration is most readily and constantly perceived: the axilla, the top of the shoulder above the clavicle, the subclavian region before, and the subscapular region behind.

63. The respiratory murmur is louder in children than in adults; and in adults, whenever any portion of the lungs is rendered unable by disease to perform its proper functions, the other portions of the lung are called on to perform more than their ordinary part, in which cases those portions yield a louder sound than natural, a sound as loud in fact as that of a child's lungs, hence the term *puerile respiration.*

64 The intensity of the respiratory murmur differs in different individuals; in some it is heard with difficulty. In these cases it is necessary, when examining them, to desire them to breathe quicker or deeper: to cough, to repeat a long sentence aloud; by which means the inspirations immediately succeeding the forced efforts become distinctly audible.

65. Females and men of a nervous temperament oftentimes present the puerile respiration, even in the healthy state.

66. When the respiratory sound is weaker than natural in any part, there is reason to suspect either some condensation of the vesicular structure of the lung, or partial obstruction of the bronchi leading to the part, or some displacement of the lung from the walls of the chest.

67. Various causes may prevent the respiratory sound from being audible: 1st, the air may be prevented from entering the pulmonary cells of a part of the lung by the occlusion of a large bronchial tube by viscid secretion; in this case percussion will yield a clear sound. 2. The cells themselves may be filled up by liquid or solid matters, as in pneumonia and other cases: here percussion yields a dull sound. 3. The lungs may be removed from their contact with the walls of the chest by solid, liquid or gaseous matters being interposed; as in pleuritis, hydrothorax, and pneumo-

thorax; in this case the respiratory murmur is no longer heard. In the two former cases the sound on percussion is dull; whilst in the last case, *viz.* that of gaseous effusion, the sound is tympanitic.

68. In the state of health, the *bronchial respiration* is confined to the anterior and lateral parts of the neck, though in very thin persons it may be heard towards the superior part of the sternum, and in the interscapular space.

69. Whenever the vesicular respiration is obstructed by disease, either by obstruction or compression of the air cells (as in pneumonia, pleuritis, and tubercles), the bronchial respiration is then heard in points where it is inaudible in the healthy state.

70. Whenever a cavity is formed in the lungs, the entrance of the air into such cavity produces a sound resembling the bronchial respiration, when heard at the anterior part of the neck; this is called *cavernous respiration.*

71. In cases wherein either the

bronchial or *cavernous* respiration exists, it is sometimes observed, that when the patient breathes quickly and by fits, during inspiration the air appears as if drawn from the auscultator's ear, whilst in expiration it seems blown into it. This indicates the proximity of the cavity to the surface of the lung. This sort of puffing and blowing is equally produced during coughing and speaking. This variety also presents another modification, called by Laennec *souffle voilé, the veiled puff.* In this case it seems as if every vibration of the voice, cough, or respiration agitates a sort of moveable veil interposed between the cavity and the ear.

72. *Adventitious sounds connected with respiration*—The term *râle, rhoncus*, or *rattle*, has been employed to express all the sounds besides those of health, which the act of respiration gives rise to from the passage of the air through fluids in the bronchi or lungs, or by its transmission through any of the air-

passages partially contracted. It should be remarked that these sounds accompany the cough, and are even made more perceptible by it.

73. Laennec distinguished five varieties of rhonchi: 1, the moist crepitous rhonchus, or *crepitation*; 2, the mucous rhonchus, or guggling; 3, the dry, sonorous rhonchus, or *snoring*; 4, the dry, sibilous rhonchus, or *whistling*; 5, the dry, crepitous rhonchus with large bubbles, or *crackling*.

74. As these different kinds of rhonchi have their site either in the air cells, or bronchial tubes, or in some morbid excavations formed in the substance of the lungs, and are caused either by some substance within these, more or less fluid, and moving in contact with air, or by some other obstruction in the air-passages from external compression, or alteration of their coats, a very convenient and practically useful arrangement of them has been given by Dr. Forbes,* which is as follows:

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* See "Forbes' Laennec," ed. 4, p. 49; and "Cyclop. Pract. Med. Art. Auscult."

—1. Rhonchi having their site in the vesicles, or air cells—*vesicular rhonchi*; 2, rhonchi having their site in the bronchial tubes—*bronchial rhonchi*; 3, rhonchi having their site in morbid excavations—*cavernal rhonchi.*

75. Each of these may again be sub-divided into two kinds—viz humid, and dry; according as they depend on the presence of a liquid, or on some modification in the calibre of the air passages, or on some [illegible] obstruction.

76. According to this arrangement we shall have the following classification :—

I. *Vesicular Rhonchi.*

1. The humid vesicular rhonchus (the *râle crepitant* of Laennec). This is compared to the crepitation of common salt when thrown on a hot iron. This rhonchus is characteristic of the first stage of pneumonia—it appears with the commencement, disappears when hepatization has occurred, and re-appears with the partial resolution of the inflammation.

It is also heard in œdema and in hæmoptoic engorgement of the lungs. In the two last cases, however, it seems to be produced by larger bubbles, and approximates to the bronchial rhonchus.

2. The dry vesicular rhonchus: this is characteristic of emphysema of the lung, more particularly interlobular emphysema,—it is heard only during inspiration.

II. *Bronchial Rhonchi.*

1. The moist bronchial rhonchus—mucous *râle*. This resembles the sound produced by blowing bubbles with a pipe in soap and water. The site of this is the bronchial tubes,—it is produced by the passage of air through tubes containing a liquid. This rhonchus may occur in any disease of the lungs, accompanied with much expectoration: it principally characterizes bronchitis and hæmoptysis. A variety of this is the *tracheal rhonchus*, which is heard when there is much mucous or other sputa in the larynx, trachea, or larger bronchial tubes.

2. The dry bronchial rhonchus. There are two varieties of this. *a.* The sibilous rhonchus; the *râle sibilant sec* of Laennec. *b.* The sonorous rhonchus, *râle sonore sec* of Laennec. The former has been compared to the chirping of birds, or to the sound occasioned by the sudden separation of two portions of an oiled stone. The sonorous rhonchus resembles somewhat the snoring of a person asleep, or the bass note of a violoncello, or the cooing of the turtle dove. These varieties have been attributed by Laennec to a diminution in the calibre of a bronchial tube. They are heard in dry catarrhs.

III. *Cavernous Rhonchi.*

Of this but one variety has been described; *viz.* the moist cavernous rhonchus—*gargouillement*, or gurgling, *râle caverneux* of Laennec. This is heard when there is a [illegible] excavation in the lung containing a liquid, and communicating with the bronchi, as in abscess or gangrene of the lung, and in the latter stage of tubercles. It is distinguished from the moist bronchial rhonchus by being circumscribed to a small spot of the lung, whilst the moist bronchial rhonchus is diffused over a considerable extent of surface.

Metallic Tinkling.

77. This phenomenon consists of a peculiar sound, closely resembling that emitted by a cup of metal, glass, or porcelain, when struck gently with a pin, or into which a grain of sand has been let fall, and may be heard whilst the patient breathes, speaks, or coughs. It is heard in the most striking manner when the patient coughs, and therefore, when it is doubtful, this action ought to be performed.

78. Should pectoriloquy exist at the same time, both the voice and the metallic tinkling are observed to traverse the stethoscope; but if not, there is merely heard within the chest a slight, sharp sound, like to that produced by the vibration of a metallic cord when touched with the finger.

79. The metallic tinkling depends

on the resonance of the air agitated by respiration, by coughing, or by the voice, at the surface of a liquid, which, together with this air, forms the contents of a morbid excavation. It can exist, therefore, only in two cases; 1, when a serous or purulent effusion co-exists in the pleura with pneumothorax: 2, when a large tuberculous cavity co-exists with a very liquid pus.

80. For the production of this phenomenon, in cases of emphysema or hydrothorax complicated with pneumothorax, it is necessary* that the cavity of the pleura should communicate with a bronchial tube by means of a fistula. Hence this sign may be considered as pathognomonic of this triple affection.

81. A modification of this phenomenon has been observed by Laennec, which he has called *bourdonnement amphorique, amphoric resonance, utricular buzzing,*—this resembles the sound produced by blowing into

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* The necessity of this communication has been denied by Dr. Williams. (Rat. Exp. p. 126, &c.)

flask or bottle. Like the tinkling, is equally produced by the respi-ation, cough, or voice; it also co-xists, and sometimes alternates ith it.

82. The metallic tinkling may also e heard independently of the res-iration, cough, or voice; namely, hen a patient labouring under neumothorax with liquid effusion, s placed in the sitting posture, and ome of the liquid which still adheres o the upper part of the cavity falls n drops into that beneath.

83. There is another sound, called y Laennec *the sound of friction of scent and descent*, which is a dull ound, such as would be produced nder the stethoscope by the friction f a finger against a bone, and further onveying the sensation as of a body alling and rising, and at the same ime rubbing somewhat harshly gainst another. This sound of riction is perceived in every case where the pleura is rough or uneven. t exists in pleurisy with little or no iquid effusion, and where the pleura s merely covered with a false mem-

brane, and in cases where the effusion is only in moderate quantity, and the free motion of the lung is not impeded by old adhesions. It exists also in interlobular emphysema; but it is supposed by some that there must be a complication of pleurisy with this affection in order to its production.

CHAP. IV.

AUSCULTATION OF THE VOICE.

84. The sound of the voice in the different parts of the organs of respiration, and in their different states, in health and in disease, presents several important varieties. In a healthy lung this sound is very slight, whether examined by the naked ear or stethoscope, being only a slight vibration, similar to that felt on applying the hand.

85. When exploring the voice the stethoscope should be used with its obturator in its place, the instrument should be pressed with considerable

force on the chest, and the ear should be laid lightly on the other extremity.

86. If the stethoscope be placed on the larynx, trachea, or on the fore part of the throat of a person, whether in health or disease, and the individual be desired to speak, the words are then distinctly heard to pass directly through the instrument into the ear of the auscultator, just as if the mouth of the speaker were actually applied to its pectoral extremity. This has been called *laryngophony.*

87. Nearly the same phenomenon is produced when the stethoscope is applied over the origin of the larger bronchial tubes, as, for instance, in the interscapular region; in this latter case, however, the words do not traverse the tube, but seem, as it were, to play around its extremity. This is called *bronchophony.*

88. The sound of the voice is scarcely at all perceptible in the smaller bronchi distributed through the lungs, when these organs are healthy, the loose texture ot the lungs, rarified moreover by the inter

mixture of air, rendering it a bad conductor of sound. The softness also of the bronchial branches, after they cease to be cartilaginous, contributes to produce the same effect, whilst the smallness of their calibre must render whatever sound is produced more acute, and weaker in them than in the larger trunks.

89. Should any or all of these adverse conditions be removed, the resonance of the voice will become perceptible, even in the smaller bronchial tubes. Thus when the tissue of the lung is condensed by an attack of pneumonia, by hæmoptysical engorgement, by an accumulation of tubercles in the same point, or when there exists dilatation of the bronchi, a resonance is produced similar to *bronchophony*, and which may therefore be called *accidental bronchophony*.

90. The more frequent sites of bronchophony are the interscapular region and the subspinous fossæ of the scapulæ, in consequence of the proximity of the great bronchial tubes and of the frequency of hepa-

tisation of the lower lobes of the lungs; the axillary and sub-clavian regions, in consequence of the greater prevalence of tubercles in the upper lobes. The phenomenon, however, may occur in any point of the thoracic parietes.

91. As well as *bronchophony*, so also *pectoriloquy*, may become developed in parts where it does not exist in the state of health. Thus when there is an excavation in the lung, either by the softening of tubercles, by the decomposition of a gangrenous eschar, by an abscess in consequence of pneumonia, or from any other cause, the resonance of the voice is heard over the site of the cavity, precisely as it is heard when the stethoscope is applied to the larynx. This accidental laryngophony is called *pectoriloquy* (chest-speaking, from *pectus* and *loquor*).

92. *Pectoriloquy* may be either *perfect*, *imperfect*, or *doubtful*. It is perfect, when the transmission of the voice through the instrument is complete, and when it is circum

scribed to one spot, *imperfect*, when either of these characters is wanting; *doubtful*, when the resonance is very feeble, and when it can be distinguished from bronchophony only by its site and the history of the case.

93. Four conditions are necessary for perfect pectoriloquy: 1, complete emptiness of the excavation; 2, increased density of its parietes; 3, free communication with one or more bronchial tubes of a certain calibre; 4. proximity to the thoracic parietes. Excavations of a moderate size and of a rounded shape afford the most perfect pectoriloquy.

" The conditions most favourable to pectoriloquy are, that the cavity should have dense walls, that it should be near the surface of the lung, and that, by mutual adhesion of the two pleuræ, the walls of the chest should themselves contribute to form it, and that the cavity itself should be empty. Thus a cavity that produces cavernous breathing may not produce pectoriloquy. It must not be too small, or it will not allow sufficient reverberation to the voice; it must not be too large, or the voice will be lost in an indefinite hum.' — *Latham, Clin. Med.* p. 230.

94. When the excavations are very large, and when they communicate with the bronchi by small openings, pectoriloquy is very indistinct.

95. Pectoriloquy disappears when the excavation opens into the pleura, particularly if the opening is large and direct, and when its contents escape through the walls of the chest into the cellular membrane outside.

96. Pectoriloquy may be temporarily suspended, should the contents of the excavation obstruct its communication with the bronchi.

97. Pectoriloquy may be heard on any part of the chest, as morbid excavations may exist in any part of the lungs; but as these excavations most commonly result from the evacuation of tuberculous matter, aod as tubercles are principally developed in the upper lobes, it is observed most frequently below the clavicles, and in the axilla.

98. There is another phenomenon, which consists in a peculiar sound of the voice accompanying or following the articulation of words; it is characterised by a tremulous, jerking voice like that of a goat, and having an acute silvery tone, which is sharper and shriller than that of the patient's natural voice; this, from its bearing some resemblance to the tremulous or bleating voice of the goat, has been called *ægophony*, from αἲξ, *a goat*, and φωνὴ, *a voice*.

99. When ægophony exists in the vicinity of a large bronchial trunk, particularly towards the root of the lungs, it is frequently combined with more or less of bronchophony: this combination bears some analogy to the nasal intonations of Punch.

100. *Ægophony* indicates the existence of pleuritis, either acute or chronic, with moderate effusion into the pleura; it also characterises *hydrothorax*, or other liquid extravasation into the same cavity.

101. There are three cases of pleurisy in which ægophony will not be

heard; 1st. where the effusion is very rapid, and very copious; 2d, where a former attack of the same disease has firmly attached the posterior parts of the lung to the pleura; 3d, when there is very little liquid effusion, but the formation merely of false membranes.

102. When the effusion is very great, ægophony disappears entirely.

103. Pectoriloquy will almost always be distinguished from ægophony by the exact circumscription of the sound to a small space, by its situation, and by considering the accompanying phenomena, such as the cavernous respiration, &c.

104. True and simple ægophony is characterised by the harsh, tremulous, silvery tones of the voice, which is commonly more acute than the natural voice of the patient, and seems to be quite superficial, and to float, as it were, on the surface of the lungs, instead of coming from the interior like pectoriloquy and bronchophony—it seems, moreover, to be rather the echo of the voice repeating the words or their final syllables in a

sharp tremulous key, than the voice itself.

105. When the patient sits or stands the ægophony is usually heard between the scapulæ and at their lower edge; whilst, if the patient lies on his belly, or leans forward so as to bring the body into an almost horizontal position, the ægophony disappears from the interscapular region.

106. Bronchophony will be distinguished from ægophony by the presence of the bronchial respiration, and by its being always heard at the same place, whatever be the position of the patient.

107. In order that the existence of ægophony may be detected, the directions given in section 85 should be observed.

CHAP. V.

AUSCULTATION OF THE COUGH.

108. When the lungs are healthy, coughing excites no particular sound within the chest.

109. When we apply the stethos-

ope over the larynx or trachea, or over the root of the lungs where the chest is narrow, besides the shock communicated by the cough, we also hear a sound as of the transmission of air in a tube.

110. In hepatization of the lungs this sound becomes more manifest at the root of the lungs, and even in the bronchial tubes not larger than a goose quill, than it is in the trachea even in health. Hence it has been designated the *tubary cough*—by Andral, the *bronchial cough.* The same phenomenon is also observed in pleurisy, but at the roots of the lungs only.

111. This tubary or bronchial cough exists also in dilatation of the bronchi, and may serve to estimate the degree of dilatation.

112. When there is a cavity in the lung communicating with the bronchi, the cough sounds as it does in the larynx, but it is more circumscribed.

113. If the cavity contain much matter not in a very liquid state, the cough will give rise to the *cavernous*

rhonchus, and that more readily even than simple respiration.

114. Metallic tinkling is also produced by coughing, even when the respiration and voice fail to give rise to it.

115. When the bronchi are obstructed by sputa, and pectoriloquy is thereby suspended in a tuberculous excavation, coughing will, by expelling the sputa, restore the pectoriloquy, or give rise to the cavernous rhonchus, which, as a diagnostic sign, is equivalent.

116. In cavities where the tuberculous matter is only beginning to soften, and in the incipient abscess of pneumonia, coughing will often occasion very perceptible guggling, when simple respiration will fail to excite it.

117. All the rhonchi are rendered more audible during coughing than in ordinary respiration.

118. In dry catarrh the respiratory murmur is frequently inaudible under ordinary circumstances. In such a case the act of coughing, which is

lways either preceded or followed by strong inspiration, will enable us to ear the respiratory sound, and conequently to judge of the state of the ungs.

119. In incipient pneumonia, wherein the sound on percussion may be doubtful, and the respiratory sound inaudible, the cough will restore the respiratory murmur, where the lungs are pervious, and thus produce the crepitous rhonchus, the characteristic sign of the disease in question.

CHAP. VI.

AUSCULTATION OF THE HEART'S ACTION.

120. The diagnosis of diseases of the heart by auscultation is founded on the same principles as that of pulmonary diseases. As the heart, in the state of health, presents certain motions and sounds depending on its structure and physiological action, and as these motions and sounds are changed from their normal character

by disease, it is evident that in order to be able to detect the abnormal actions and change of structure of this organ, we must have correct ideas of its natural movements and healthy sounds, and also of their various relations.

121. When we explore the state of the heart by percussion, the pleximeter lined with wash leather, in order to prevent its clacking, is recommended, more particularly when great delicacy is required.*

122. When one extremity of the stethoscope is placed on the cartilages of the ribs, or lower part of the sternum, and the ear is applied to the other, a sensation is communicated as if it were elevated by each stroke of the heart—this is called its *impulse*.

123. When we apply the naked ear or a stethoscope to the præcordial region, we distinctly hear two successive sounds, followed by an interval of repose.

124. The former of these sounds, which is synchronous with the impulse, and in vessels near the heart with the pulse, is duller and more

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* Hope on Diseases of the Heart. p. 7.

prolonged, terminating without any ppreciable interval in the latter, which is louder and smarter, like the lapping of a bellows valve, or the apping of a dog.

125. The *first sound* is occasioned by the systole of the ventricles, and the *second sound* by the diastole of the ventricles.

126. With respect to the *motions of the heart* the following conclusions have been deduced by Dr. Hope, from a vast number of experiments instituted by him :—

First. The auricles contract so immediately before the ventricles, that the one motion is propagated into the other, almost as if by continuity of action.

Second. The contraction of the auricle is inconsiderable, not amounting probably to one-third of its volume, so that the quantity of blood expelled by it into the ventricle is much less than its capacity would indicate.

Third. The contraction of the ventricle is the cause of the impulse.

Fourth. It is the apex of the heart which strikes the side.

Fifth. The ventricular contraction commences suddenly, but is prolonged until an instant before the second sound, which instant is occupied by the ventricular diastole.

Sixth. The ventricles never appear to empty themselves completely.

Seventh. The contraction of the ventricles is followed by their dilatation, which is an instantaneous motion, accompanied with an influx of blood from the auricles, by which the ventricles re-expand, whilst the apex collapses, and recedes from the side.

Eighth. After the dilatation there is a repose of the ventricles, which remain in a state of apparently natural fulness, until they are again stimulated by the next auricular contraction.

127. With respect to the *rhythm*, that is, the duration of the several parts of the series which constitute a beat, it is the same as described by Laennec, viz.: 1, the ventricular

stole occupies about half the time
a whole beat ; 2, the ventricular
astole occupies one-fourth, or at
ost one-third ; 3, the interval of ven-
icular repose occupies one-fourth,
r rather less, towards the termina-
on of which the auricular systole
kes place.

128. With respect to the *extent*
ver which the movements of the
eart are perceptible, it may be ob-
erved that in the healthy state the
ulsations of this organ are confined
the præcordial region.

129. With respect to the *impulse*, it
ay vary from the ordinary standard
n different individuals in health, and
n the same individual in disease ; 1,
n its relation to the sounds : 2, in
ts degree or intensity ; and 3, in the
xtent over which it may be disco-
vered.

130. The impulse is usually syn-
chronous with the first sound ; but
occasionally, though rarely, it accom-
panies the second sound also. This
however differs from the normal
mpulse which accompanies the first
sound—it seems to have its ori-

gin much deeper within the chest than the other stroke, and in giving it the heart seems to recede from the ear; it is very slight when compared with the normal impulse. Dr. Hope calls this second impulse the *back stroke*; and considers it as generally confined to cases of hypertrophy with dilatation.

131. With respect to the intensity of the impulse, it varies considerably, even in health, in different individuals. A brief, sharp impulse, without any heaving of the heart, indicates that the parietes of the organ are thin: whilst a strong prolonged impulse, characterised by an extensive heaving movement, is a sign that the parietes are thick; whatever tends to hurry the circulation, as running, &c., or to produce mental excitement, may increase the impulse. In these cases the contractions of the heart are also augmented. Preternatural impulse, with natural frequency of pulse, generally indicates hypertrophy.

132. Hence, when we wish to examine a patient in whom we suspect disease of the heart, we should wait

ll the individual be perfectly calm.

133. Causes of a depressing nature, as blood-letting, diarrhœa, and long continued abstinence, &c., have a tendency to diminish the intensity of the impulse. Embarrassment of the respiration and of the circulation may also diminish the force of the impulse, even though hypertrophy may exist. Hence diminished impulse does not necessarily infer the absence of hypertrophy.

134. With respect to the range or extent of the impulse, it is, in the state of health, confined to the præcordial region, that is, to the space confined between the cartilages of the fifth and seventh ribs, and the lower part of the sternum. This sphere, however, is extended by increased size, as also by increased action of the organ, by changes in the structure of adjacent organs, such as solidification of the adjoining parts of the lungs, effusion of fluids into the pleura or pericardium, adhesion of the lung to the costal pleura, or of the pericardium to the heart, or in general by any cause which tends to in-

crease the density, and consequently the conducting power of the parts which receive the shock. Simple hypertrophy does not much increase the extent of impulse; but when hypertrophy and dilatation are combined, the impulse is sometimes distinctly perceived under the clavicle, on the right side of the sternum, and sometimes even on the back.

135. With respect to the sounds of the heart, they are observed to vary in different individuals, both with respect to their individual characters and to their relation to the impulse, and to each other. They are very loud in some, and the reverse in others. Great impulse and great sound never co-exist in health to any degree, and the reason is obvious: they depend on opposite conditions of the ventricles, the impulse being great in proportion to the thickness of the ventricular parietes, and the sound to their thinness.

136. The sounds of the heart are far less limited than its impulse; and the extent of sound is much greater in children, in females, in lean persons,

nd in those who have narrow or mall chests.

137. Where great range of sound o exists with great frequency of ulse, we cannot place much depenlence on it as a morbid sign; but vhen such a range is accompanied vith a slow pulse it is more deserving f attention.

138. All diseases of the lungs, which ave the tendency to render those rgans better conductors of sound, s hepatisation, compression from leuritic effusion, tuberculous deposiion, &c., will considerably augment he range of the sounds of the eart.

139. When exploring the sounds f the heart, it should be remembered hat the sounds of respiration may ccasionally obscure them. In case f disease, therefore, where a loud honchus exists, it is necessary, in rder that we may clearly ascertain he nature and extent of the heart's ounds. to observe them between inspiration and expiration.

140. The intensity of the heart's ounds progressively diminishes in

the following order: it is loudest in the left anterior part of the chest, the right anterior part, the left posterior part, and the right posterior part—any considerable deviation from this order may be looked on as the result of disease.

141. Persons with well-formed chests, and in whom none of the causes which can produce extensive range of sound exist, are seldom found to enjoy good health when the sounds of the heart are heard beyond the ordinary sphere.

142. Besides changes in the degree, extent, and rhythm of the heart's sounds, their very character may be changed; new sounds may be either superadded, or may take the place of the natural sounds—the most common of these adventitious sounds is *the bellows sound (bruit de soufflet)*, *the saw sound (bruit de scie)*; and the *rasp sound (bruit de râpe)*. These may either take the place of the natural sounds or be superadded to them; and they may be present with either the first or second sound, but more frequently with the first. The

irst resembles the puffing of a pair f bellows, and conveys the idea of moothness; the saw and rasp sounds esemble the sounds made by the awing and rasping of wood, and give he idea of roughness. They may pass gradually and imperceptibly into one another; the saw and rasp sounds are generally louder, and enjoy a wider range than the bellows sound, which is usually limited to the place where it originates. When the saw sound exists in the heart, it may always be traced along the arch of the aorta to the carotids and subclavian arteries. These sounds may all be heard in arteries at a distance from the heart, more particularly the bellows sound; often also even when they do not exist in the region of the heart.

113. These morbid sounds have been said to arise from anormal motions or currents produced in the column of blood, whereby this, which ordinarily glides on smoothly, is thrown into sonorous vibration. Permanent alteration in the calibre of the vessels through which the blood passes, and

contraction of some of the orifices of the heart, have been assigned as the most probable causes of these sounds.

144. The simple bellows sound is more common, and arises from slighter causes than the saw or rasp sounds. It may be occasioned by mere pressure on an artery, and when it is present in the heart, it may sometimes be removed by blood-letting.

145. With respect to the causes of these sounds the following conclusions have been deduced: 1, that these sounds arise from some alteration in the channel through which the blood passes, which alteration may be merely temporary, arising from nervous causes, or, as is more frequently the case, from some physical alteration in the channels conveying the blood,—either a contraction or enlargement of calibre; 2, that the presence of these sounds does not necessarily infer the existence of organic disease; and that when they disappear after repose and depletion, or without any evident cause, we have reason to suspect that they ori-

inate in functional disorder ; 3, but hat when they continue even after he above-mentioned means, or are nerely diminished, there is reason o think that there is organic disease of the valvular orifices ; 4, and that he more they approximate to the haracter of the rasp sound, the stronger is the probability of organic change ; 5 extreme contraction of the valvular orifice produces a weaker sound than when it is moderate.

146. There is another adventitious sound, called *craquement de cuir*, from its resemblance to the crackling of new leather, which is supposed to be produced by the friction of the heart against the pericardium, when one or both these organs have lost their polish from the effusion of solid lymph, with little or no serum. This is now considered characteristic of pericarditis.

147. There is a phenomenon generally accompanying the rasp and saw sounds, called by Laennec *frémissement cataire ;* which, like the impulse, is to be judged of by the sense of touch ; this is a *thrill*, or

purring tremor, felt when the fingers are placed on the heart or an artery. It seems to depend on the same pathological condition as the rasp and saw sounds.

CHAP. VII.

SUCCUSSION.

The practice of succussion is as old as Hippocrates himself. Mention is made of it on more than one occasion in his writings; it consists in shaking the patient's body with some degree of force, and observing the sounds thereby produced. In order that any results may be obtained from this method, it is necessary that the liquid, whose presence we desire to detect in a cavity, should be mixed with air. The instances in which this combination occurs are: 1, pneumothorax, in which both liquid and air are effused into the cavity of the pleura; 2, a large tuberculous cavity in the chest, containing an admixture of both pus and air; 3, the presence of a liquid and a gaseous fluid in the stomach and intestines.

The method of practising succussion is as follows:—the patient being seated either in a chair, or in bed, is to be shaken by the shoulders quickly, but not violently, the operator suddenly stopping the succussion, and observing whether the sound of fluctuation has been produced.

Dr. Latham purposes to divide the unnatural sounds referable to the lungs, whether in breathing, speaking, or coughing, *generically* into *two;* into *dry* sounds, and *moist* sounds. The *dry* sounds proceeding from the air passages, he calls *rhonchus* and *sibilus;* the *moist* ones he calls *crepitation*. These three are produced only in breathing, not in talking or coughing. *Rhonchus* larger and hoarser,—*sibilus* smaller and shriller. *Rhonchus* proceeds from the bronchi in their first divisions, *sibilus* from them in their minuter divisions, or from the vesicular structure. The *moist* sounds occasioned by the mingling of air and fluid in the bronchi and their ramifications, during breathing, he calls *crepitations*, which he divides into *large* and *small*. The *rhonchus* and *large crepitation* have their site in the same parts, and the *sibilus* and *small crepitation*; but the states of the parts are different. When the secretion is not *fluid* enough to allow the air to penetrate it, mingle with it, and pass through it, rhonchus, not crepitation, is produced. Rhonchus is also produced by thickening of the mucous membrane, ossification of a cartilaginous ring, morbid growths from without, such as a bronchocele, an aneurismal sac, a tubercular mass in the bronchial glands, or in the lungs themselves; these may so compress or distort the trachea, or certain bronchi, that the air cannot force its way through them without continued vibrations, and without the respiration being constantly accompanied by a hoarse, unnatural sound.

The *rhonchus* may be got rid of by an effort of expectoration: not so ibilus. *Sibilus*, a more unquestionable evidence of disease than rhonhus,—sibilus and small crepitation almost always mixed,—symptoms generally become more inflammatory when sibilus increases, and *v. v.* When expectoration is freer, sibilus ess, and *v. v.*

Large crepitation is synonymous with the *râle muqueux* of the French, or what we call the mucous râle. The epithet "mucous" is incorrect, inasmuch as this râle is produced equally by air passing through mucus, or pus, or blood, or any fluid whatever.

Crepitation, which is a sign of redundant fluid in the bronchi or pulmonary vesicles, may attend different diseases; as rheums, and catarrhs, old chronic coughs, chronic diseases of the heart, in which it may be attended or not with fever and inflammation; it is also an accompaniment of hæmoptysis.

The sibilus appears to be the principal sign of spasmodic asthma.—According to Dr. L. the natural moisture of the respiratory passages is then in defect, and the sibilus is an index of this defect.

According to him sibilus occurs in two forms of bronchial disease:—1st, as it intervenes among the auscultatory symptoms of certain chronic affections, characterized by dyspnoea, expectoration, and cough. 2d, as it presents itself as the sole auscultatory symptom that attends the paroxysm of an asthmatic attack.

There are cases of bronchial inflammation, according to Dr. L., entirely distinct from asthma, in which the sibilus is the sole symptom derived from auscultation, and a dryness of the air passages the sole pathological condition. This inflammation may begin and end with the *first stage*, and never go beyond that stage, convalescence taking place without any expectoration— p.1[illegible].

Crepitations (moist sounds) are divided into *large* and *small*. *Large crepitation* arises from air meeting and mingling with fluid in the larger bronchi; small from the same conditions in the smaller bronchi, and the vesicles of the lungs.

CHAP. VIII.

AUSCULTATORY SIGNS OF PREGNANCY.

When either the naked ear or a stethoscope is applied to the abdomen of a female who has arrived at about half the term of pregnancy, two phenomena are discovered:—First, a simple pulsation, accompanied with a soufflet, called *bruit placentaire*, or *placental sound*. Second, a double pulsation, which is that of the fœtal heart.

The characters of the former, *i. e.* of the placental sound are, that of a low murmuring, or cooing, accompanied by a slight rushing noise, unaccompanied by an impulse. It is evidently an arterial pulsation, and exactly synchronous with the maternal pulse—does not change its situation during the entire course of the same pregnancy—is liable to intermissions, and is heard generally on the side directly opposite to that of the fœtus. The extent also to which it is heard is limited to a very small space, about three or four square inches—it usually becomes perceptible about the fourth month, and may be heard very distinctly as soon as the uterus has risen above the pelvis, and can be brought in contact with the walls of the abdomen by pressure on them with the stethoscope.

The characters of the latter phenomenon, *i. e.* of the fœtal pulsations, are—they are occasioned by the contraction of the fœtal heart: they become distinctly audible in the sixth month, or sometimes earlier: they vary from 120 to 160 pulsations in the minute, being double that of the mother's pulse; they are not affected by any change in the maternal pulse. The pulsations communicated to the ear very much resemble the tick-tack of a watch. The space of pulsation is generally near a foot in length, and three or four inches in width. The place where these pulsations are heard varies occasionally according to the position of the infant, but it is easily discovered, the sound increasing as we approach, and diminishing as we recede from the true lace.

The interposition of folds of intestines between the uterus and the bdominal parietes, an excessive uantity of the liquor amnii, debility, nd change of position occasionally revent the fœtal pulsations from eing heard for some hours or even ays. In the case of two or more œtuses, we shall hear an equal umber of fœtal hearts.

CHAP. IX.

YMPTOMS AND PHYSICAL SIGNS OF SOME OF THE PRINCIPAL AFFECTIONS OF THE THORACIC VISCERA.

Bronchitis.

By bronchitis is meant inflammation of the mucous membrane, hich lines the internal surface of e bronchi or air passages of the ungs. It may assume two forms, e *acute* and *chronic*.

Symptoms.—Of the acute. At first feeling of roughness in the trachea;

irritation in the throat, dyspnœa, and dry cough, with a sense of tightness or constriction across the chest. Symptoms of fever are also present. After some time expectoration of a [illegible], transparent, glairy mucosity, somewhat resembling the white of egg. According as the affection tends to resolution, the sputa change their appearance; the mucosity of which they consist gradually loses its transparency, becomes mixed with opaque, yellow, whitish, or greenish masses, which, though scanty at first, increase by degrees, and ultimately constitute the entire of the matter expectorated. This change in the sputa is accompanied with a general amelioration in the symptoms, and the disease tends to resolution. When, however, instead of thus terminating, the affection passes into the chronic form, the appearance of the sputa continues the same as in the latter period of the acute stage.

2. *Physical signs.*—The enlargement of the mucous membrane of the air tubes, and consequent diminution in their calibre, give rise a

first to certain modifications in the respiratory murmur, called ordinarily the *sibilous rhonchus* and the *sonorous rhonchus.* When the secretion of the inflamed mucous membrane is established, a bubbling sound is heard, occasioned by the passage of the air in the bronchi ; this is the *mucous râle*, or rhonchus.

3. It sometimes happens that the respiratory murmur is no longer heard over a considerable extent of the lung in bronchitis; this is occasioned by mucus obstructing some large bronchus, and preventing the ingress of the air; the sound on percussion, however, in such a case is clear, a circumstance which will prevent the auscultator from confounding this state with hepatization of the lung. The removal of the obstructing pellet of mucus by expectoration will at once restore the respiratory murmur.

Pneumonia.

4. In pneumonia the seat of the inflammation is the parenchymatous structure of the lungs.

5. *Symptoms.*—Fever; some degree of pain in the chest; breathing hurried and oppressed; cough; expectoration very viscid and rust-coloured.

6. *Physical signs*—Sound on percussion dull over the affected part. Over this same part the respiratory murmur feeble and scarcely perceptible, or altogether marked by the *crepitating rhonchus*, the respiration being puerile in the unaffected parts of the lung. This constitutes the first stage of pneumonia. If the disease tends to resolution, the crepitating rhonchus diminishes in extent and intensity: the normal respiratory murmur returns; the sound of the chest on percussion becomes less dull. If, on the contrary, the disease proceeds unabated, the dulness on percussion increases; the crepitating rhonchus is no longer heard; the lung, being no longer pervious to air, the respiratory murmur disappears altogether, except in parts corresponding to the large bronchi, where the respiration be-

comes bronchial. Bronchophony also is sometimes perceived in these parts. This is the second stage, or that of hepatisation. Should resolution now take place, the disease will be found to retrace its steps, and to go back by precisely the same stages by which it had proceeded thus far. But if the disease continues to advance towards the third or suppurative stage, in addition to the dulness on percussion there is sometimes heard a coarse, mucous rhonchus, especially at the root of the lungs. Should the suppuration go on to the formation of abscess, this will be indicated by a gurgling or cavernous rhonchus; and when the contents of the abscess have been evacuated, *cavernous respiration* and *pectoriliquy* manifest themselves. If the cavity be very large, the metallic tinkling may be heard. When the termination of pneumonia is gangrenous, the fœtor both of the breath and of the expectoration will announce such an occurrence.

Pleurisy.

7. By pleurisy is understood inflammation of the serous membrane which lines the cavity of the chest: and invests the lungs. It may be acute or chronic.

8. *Symptoms.*—At the [illegible] pyrexia; acute pain in some part of the chest; immobility of the ribs, those particularly which correspond to the part affected; respiration painful, frequent, hurried, with short inspiration, and slow and full expiration; a hard dry cough, unless the disease be complicated either with pneumonia or bronchitis.

9. *Physical signs.*—When effusion takes place, the sound becomes dull on percussion; the respiratory murmur becomes feeble, according as the effusion proceeds, until at length it disappears altogether, except along the vertebral column, where it is still perceptible to some extent, though feebler than on the opposite side. On applying the stethoscope along the posterior border of the scapula, towards its inferior angle.

and desiring the patient to speak, his voice is observed to acquire a particular character, which is now considered one of the most characteristic signs of pleuritic effusion, and is called ægophony. When the effusion becomes considerable, the ægophony is no longer heard; the intercostal spaces become enlarged and elevated, the affected side is more dilated than the sound one; the respiration is puerile in the sound lung.

Phthisis.

10. *Symptoms and signs*.—The ordinary form of pulmonary consumption generally sets in with a slight dry cough, which may last for a considerable time without being much aggravated, or the supervention of any new symptom. In other cases, the cough may be severe from the commencement, and may be accompanied with expectoration of mucus; or hæmoptysis may set in and recur at variable intervals, and give the first intimation of the disease. Considerable languor is complained of by the patient; even

slight exertion, or ascending a hill, or going up stairs, hurries the breathing: the pulse also is more frequent than natural.

11. This state having lasted some time, and the cough and expectoration going on to increase, hectic fever manifests itself, the constitution sympathising with the local affection. Two exacerbations in general take place in the twenty-four hours; one towards noon; the other commencing at about five or six o'clock in the evening, with a sense of chilliness, which continues for about an hour, then the skin becomes warm, and the pulse is accelerated; thirst also, and general uneasiness, are felt by the patient; in about five or six hours a perspiration breaks forth, after which the patient usually falls asleep, and when he awakens in the morning, he finds himself bathed in profuse perspiration.

12. When the hectic has thus lasted for some time the patient is observed to lose flesh very rapidly, and become very languid and disinclined to any exertion. This state of

emaciation is further increased by another affection, which now supervenes, viz. diarrhœa, which is in general observed to alternate with the sweats, the one coming on when the other has ceased. The cheeks now become hollow, the cheek bones prominent, the middle of the cheeks presenting a circumscribed patch of a bright red colour, popularly called the hectic flush.

13. Some pathologists have considered phthisis divisible into three stages or periods. During the first period, that in which tubercles become developed in the lung in moderate quantity, neither the local nor general symptoms warrant us in announcing the presence of any other affection than that of a catarrh, more or less severe; if the tubercles however, be in considerable quantity, the sound on percussion will be dull, and the bronchial respiration and bronchophony heard, the vesicular murmur of respiration is either feeble or none. In the second stage, the tubercles increase both in number and size, so as to compress and obstruct the sub-

stance of the lung, and [illegible] dyspnœa. In the third stage the tubercles become softened; they make an opening for themselves into [illegible] of the neighbouring bronchi, and being thus evacuated, give rise to the formation of a cavity, the presence of which, is marked by its characteristic sign—pectoriloquy.

14. *Hæmoptysis.*—The term hæmoptysis has been restricted to the spitting of blood, which comes from an hemorrhagic exhalation from the mucous membrane of the bronchi, and pulmonary vesicles.

15. The blood exhaled in the bronchi undergoes a displacement during the passage of the air, and gives rise to the *mucous rhonchus*.

16. If the pulmonary vesicles be the seat of the hemorrhage. or if the blood exhaled in the bronchi fall into these parts, it generally becomes changed into solid clots, which obstruct the cavities of the vesicles. and prevent the air from entering them. It is to this last form of hemorrhage of the air passages, that Laennec has given the name of *pulmonary apoplexy*.

17. Percussion will, in this case, give a *dull* sound in the part, corresponding to the apoplectic engorgement. The *bronchial souffle*, and a slight *resonance of the voice*, will also be discovered in the part, and all around the affected part a *mucous rhonchus* will be heard, occasioned by the displacement of the liquid blood contained in the neighbouring bronchi.

18. *Emphysema.*—The stethoscopic signs of this affection vary according as the emphysema is vesicular or interlobular.

19. When the emphysema is vesicular, and affects but one lung, or is more extensive in one lung than in the other, the corresponding side is rounder and more developed than the other, and yields a clearer sound on percussion. Still the respiratory murmur is very feeble, and is generally accompanied with a sibilous rhonchus.

20. When the emphysema is interlobular, it is characterised by the dry crepitous rhonchus with great bubbles. This rhonchus is frequently accompanied with the sounds of the

ascending friction in inspiration, and *descending friction* in expiration.

21. *Œdema* of the lungs is characterized by diminished resonance on percussion, very feeble respiration, and a subcrepitous rhonchus, which differs from the crepitating rhonchus of the first stage of pneumonia by its bubbles seeming to be larger and more moist. In *pneumothorax*, the stethoscopic signs vary according as the lesion is simple, or complicated with a liquid effusion, or a fistulous communication between the bronchi and the pleura.

22. When *simple*, it is characterized by a clear and sometimes a tympanitic sound on percussion: the almost complete extinction of the respiratory murmur in every part, except at the root of the bronchi at the same side; by enlargement of the affected side, and displacement of the heart.

23. When *complicated* with a liquid effusion, all the preceding signs are present; and, besides, succussion will afford the sound of fluctuation.

24. When, besides a liquid and

gaseous effusion, there exists also a fistulous opening between the bronchi and the pleura, we have, besides the preceding signs, the metallic tinkling, and amphoric resonance.

CHAPTER X.

PHYSICAL SIGNS OF SOME OF THE PRINCIPAL AFFECTIONS OF THE HEART.

25. *Pericarditis.*—When the pericardium is the seat of an effusion, in addition to the dulness on percussion, which dulness, moreover, will be proportioned to the quantity of the effused liquid, auscultation will perceive the sounds of the heart, *dull* and *distant*, and the ear will not feel the impulsion. To these characters, there will be sometimes added the *bellows sound*, occasioned by the compression of the heart and of its orifices by the effusion in the pericardium.

26. If, without containing any liquid, the pericardium becomes covered

with false membranes, the heart, by its friction during each systole against the inequalities of the latter, will produce the different sounds known by the name of the *bruits de frottement, de souffle, de scie, de rape, de cuir neuf*. The last sound,* namely the *bruit de cuir neuf*, is now considered of itself characteristic of pericarditis.

27. Sounds analogous to these are heard in different lesions of the heart itself; but when these sounds are superficial, and seem to occur immediately under the ear, principally during the approach of the heart's apex, the presumption is, that the pericardium is their site.

28. *Hypertrophy of the heart* is denoted by an increase of impulse and diminution of sound, and a consequent diminution in the extent over which the actions of this organ may be heard.

29. When there is hypertrophy of the left ventricle, its contractions, explored between the cartilages of the

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* See Dr. Stokes' paper in the "Dublin Medical Journal," Nos. of 1833.

fifth and seventh ribs, give a strong impulsion, and a duller sound than natural.

30. When the right ventricle is the seat of hypertrophy, the impulsion of the heart's action is augmented, whilst the extent over which it may be heard is equally limited; in this case, it is under the inferior portion of the sternum that the impulsion is the strongest. The sound of its contractions is also less dull than in the hypertrophy of the left ventricle.

31. This distinction between the hypertrophy of the two ventricles, with reference to the part where the heart is heard with most force, always holds good. There is a case, however, in which this distinction cannot be established without difficulty; as when, for instance, the left ventricle is hypertrophied to such a degree that it becomes anterior, in which case it is more easily heard under the sternum than in the left cardiac region; whilst the right ventricle, involved as it were in the parietes of the left, becomes posterior,

and is scarce heard at all. The tumefaction and pulsation of the jugular veins, however, which are uniformly observed in hypertrophy of the right ventricle, but not in that of the left, will assist in the diagnosis.

32. *Dilatation of the heart* is denoted by diminished impulse, increased sound, and increased extent of the surface over which the action of the heart is heard. The degree of dilatation may be measured by the extent over which the heart's action may be heard. When the dilatation is limited to one ventricle, the greater sonorousness of the heart's contraction is only heard in one cardiac region; or at least it is much more marked there.

33. *Palpitations* freqnently occur in dilatations of the heart.

34. *Hypertrophy with dilatation*, which is much more common than simple dilatation, and more common also than hypertrophy without dilatation, is characterized by the presence of impulse and sound at the same time. In this case it is that

the actions of the heart are most sensible to the hand, especially when there are palpitations.

35. *Hypertrophy of one ventricle* with *dilatation of the other* is characterized by a mixture of the signs of hypertrophy and those of dilatation, with a predominance of the one or the other in one of the cardiac regions, according to the ventricle affected.

36. *Aneurism of the aorta.*—The only auscultatory signs of this affection are simple pulsations heard along the course of the vessel. On this subject M. Bouillaud expresses himself as follows :—

"When the aneurism occupies the sub-sternal aorta, the pulsations are heard under the sternum and cartilages of the ribs, over a greater or less extent of surface, according to the size of the tumour. The simple pulsation will become so much the more evident, according as the tumour may be larger and more closely connected with parts that vibrate.

"Aneurisms of the descending pectoral aorta, and those particularly which press on the vertebral column, will manifest their existence by simple pulsations, corresponding to the corroded vertebræ, a symptom [illegible] the more certain, as the double contractions of the heart are very seldom heard in the back."

37. The pulsation of an aneurism of the abdominal aorta may be distinguished from those resulting from inflammation or spasms of this vessel by the extent of the impulsion, and by the force of the sound, which is much more marked in the former than in the latter case.

38. Percussion yielding a *dull* sound over a considerable extent of the region corresponding to the simple pulsations will become a sign confirmatory of the diagnosis formed by means of the stethoscope, though in itself it should never lead to any positive certainty.

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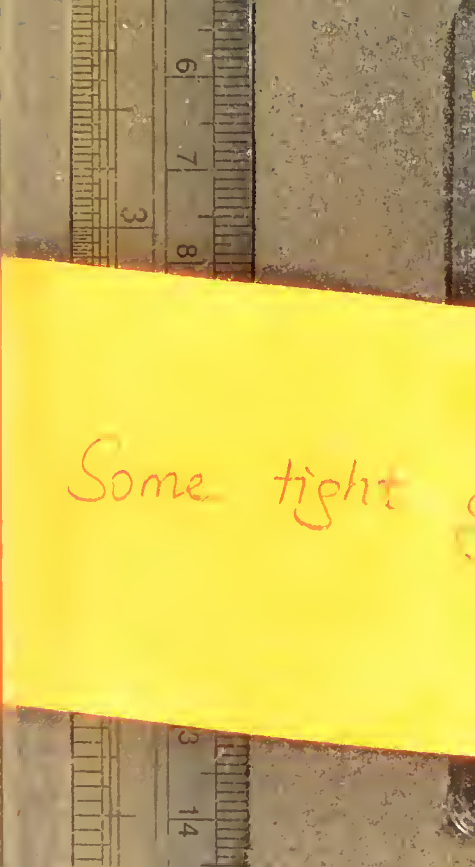

Some tight